MEL & Attributes in MAYA

Notes

- In general, use ***Help->Tutorials*** and ***Help->Maya Help***
- For syntax, use ***Help->Maya Help***; search "**MEL**" and find '**MEL for programmers**"
- This discussion will cover various ways to use MEL to model and animate in Maya
- Search web for 'Maya MEL scripts' - many resources on-line; e.g.,
  - highend3d.com/maya/downloads/mel_scripts/animation

Introduction

Ways to work in Maya

- Interactively
- MEL scripting
- C++ API

MEL - Scripting language w/ objects & attributes. Maya is implemented in MEL !

- typical control statements, variables, expressions, etc. (see tutorials)
- access Maya representation of nodes connected to each other

To see nodes, make some polygonal objects, group some together, then view node structure use ***Window->Hypergraph...***

scene object hierarchy: Directed Acyclic Graph (DAG)

nodes & connections: Dependency Graph (DG)

MEL commands can be typed in MEL command line, for example,

```
sphere;
```

Script Editor

Use icon (window w/ horizontal dividing line) in lower right of Maya window

or ***Window->General Editors->Script Editor***

Sections of Script Editor: history, input

type commands in input section, for example,

```
$i = 0;
sphere;
move -r 0 $i 0;
$i = $i+1;
```

After typing in, to execute it use CNTRL-Return; history section give Maya response to commands; use Script Editor ***File->Echo All*** to see everything executed by Maya.

Shelf Button

Make new *shelf* by using ***Window->Settings/Preferences->Shelfs..***

highlight 2rd-4th commands & CNTRL-click drag to shelf to make it a button

hit button several times

Script File

make text file (e.g., *testScript.mel*) containing:

```
for ($j=0; $j<10; $j++) {
  sphere;
  move -r 0 $j 0;
}
```

in Script Editor window, ***File->Source Script...*** to read in and execute script

UI

Maya also has facilities to create a User Interface using MEL (but not dealt with here)

Attributes

are quantities of a node - e.g., sphere's transform node contains *translation in x* attribute

reference using *nodename.attributename*: e.g. *mySphere.translateY* or *mySphere.ty*

MEL commands: *listAttr*, *getAttr*, *setAttr*, *aliasAttr*; type some of following & note results in history section of Script Editor

```
sphere;
move -r 10 20 10;
getAttr nurbsSphere1.translateY;
getAttr nurbsSphere1.tx;
listAttr nurbsSphere1;
setAttr nurbsSphere1.tz 5;
aliasAttr up nurbsSphere.ty;
getAttr nurbsSphere1.up;
```

keyable v. non-keyable attributes: *keyable* are attributes that can be keyframed

Channel Control Editor: controls keyability of attributes

Window->General Editors->Channel Control...

Channel Box: info about object's transform node, shape node, input node

Display->UI Elements->Channel Box/Layer Editor

displays keyable and displayed non-keyable attributes

can edit keyable attributes, e.g., set *translate x* to specific numeric value

Attribute Editor

edit more attributes of object than Channel Box e.g., change name of objects

delete all objects, make sphere, rename sphere to ‘mySphere’; make cone and rename it to ‘myCone’

Window->Attribute Editor

add custom attributes e.g., weight, ***Modify->Add Attribute***

Connections

can make *connection* from one object attribute to another object's attribute

use **Connection Editor:** ***Window->General Editors->Connection Editor..***

select *mySphere*, in Connection Editor, Reload Left (from)

select *myCone*, in Connection Editor, Reload right (to)

select *translate y* from left side and *translate x* from right side

if AutoConnect is selected (indicated by italicizing attributes) connection is made; else need to select hit Connect button at bottom (select AutoConnect under File)

interactively move mySphere up and down to see effect

make connection in MEL by typing in the following in command line or script editor:

```
connectAttr mySphere.tx myCone.ty;
```

and interactively move 'mySphere' around to see effect

Animation Expressions

Expressions are executed each frame. In command line type the following & hit play

```
expression -s "mySphere.translationX = sine(time);"
```

Expressions can be set up in scripts (Procedural Animation!). Make file script with:

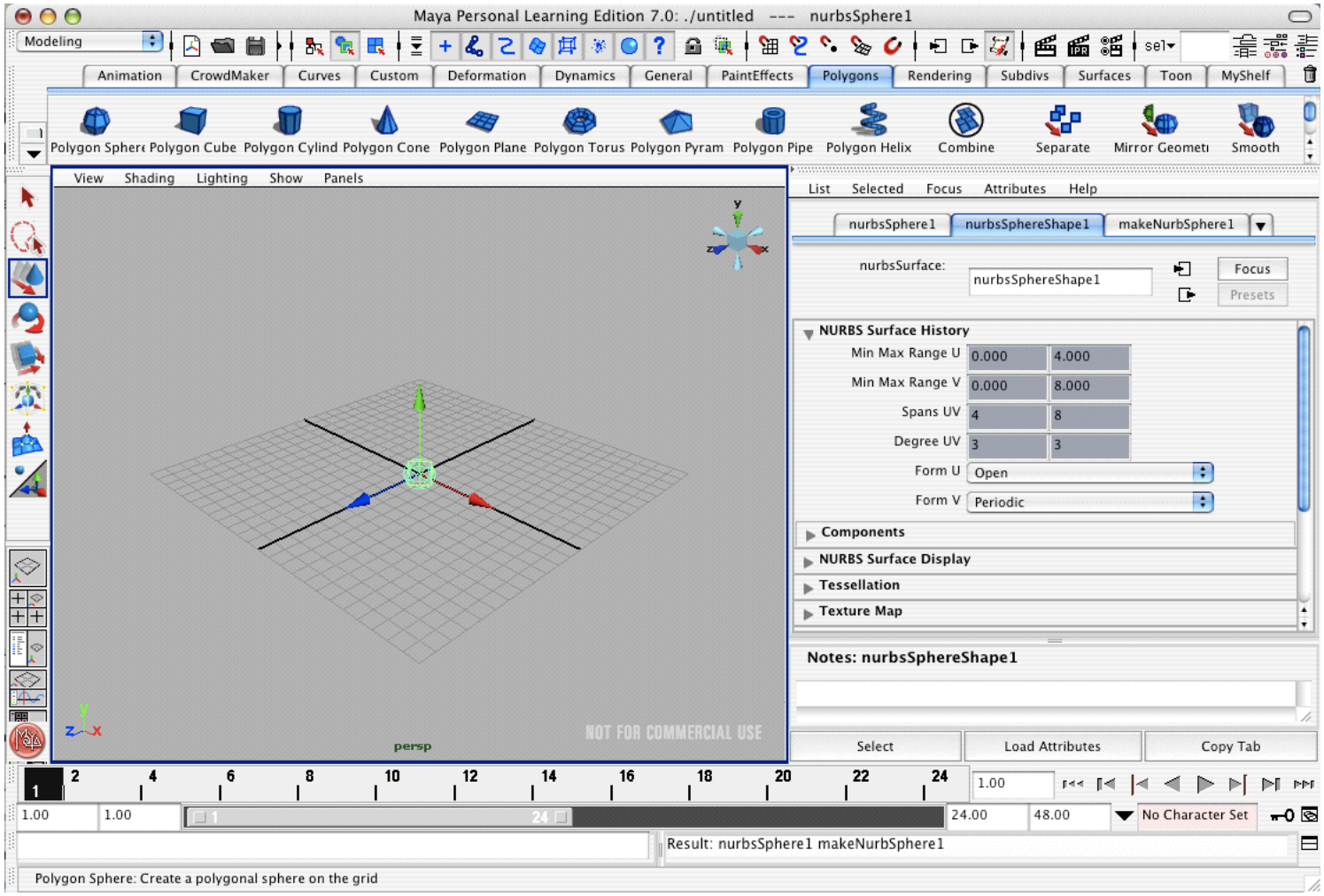
```
// http://www.fundza.com/melquickref2/#expression1
// NOTE: `sphere returns 2 strings. that's why $obj is an array
// and why $obj[0] is used in the expression
string $exp = "";
string $obj[];
for($i = 0; $i < 3; $i++) {
  $obj = `sphere`;
  move (rand(-3,3)) (rand(-3,3)) (rand(-3,3));
  $exp += "select -r " + $obj[0] + ";\n" +
        "move -moveY (rand(0,2));\n";
}
$exp += "select -clear;\n";
expression -s $exp -ae 1;
playbackOptions -min 1 -max 30;
play;
```

Source the script and see the animation

To Edit and manage expressions ***Window->Animation Editors->Expression Editor...***

Select object, select expression, edit the expression, then hit 'Edit'

in Maya->Help, find & read "Differences between expression and MEL syntax"


Maya Personal Learning Edition 7.0: ./untitled --- nurbsSphere1
Modeling
Animation
CrowdMaker
Curves
Custom
Deformation
Dynamics
General
PaintEffects
Polygons
Rendering
Subdivs
Surfaces
Toon
MyShelf
Polygon Sphere
Polygon Cube
Polygon Cylind
Polygon Cone
Polygon Plane
Polygon Torus
Polygon Pyram
Polygon Pipe
Polygon Helix
Combine
Separate
Mirror Geometı
Smooth
View
Shading
Lighting
Show
Panels
persp
NOT FOR COMMERCIAL USE
List
Selected
Focus
Attributes
Help
nurbsSphere1
nurbsSphereShape1
makeNurbSphere1
nurbsSurface:
nurbsSphereShape1
Focus
Presets
NURBS Surface History
Min Max Range U
0.000
4.000
Min Max Range V
0.000
8.000
Spans UV
4
8
Degree UV
3
3
Form U
Open
Form V
Periodic
Components
NURBS Surface Display
Tessellation
Texture Map
Notes: nurbsSphereShape1
Select
Load Attributes
Copy Tab
1
2
4
6
8
10
12
14
16
18
20
22
24
1.00
1.00
1.00
24.00
48.00
No Character Set
Result: nurbsSphere1 makeNurbSphere1
Polygon Sphere: Create a polygonal sphere on the grid